FORT FUTURE
Force Projection
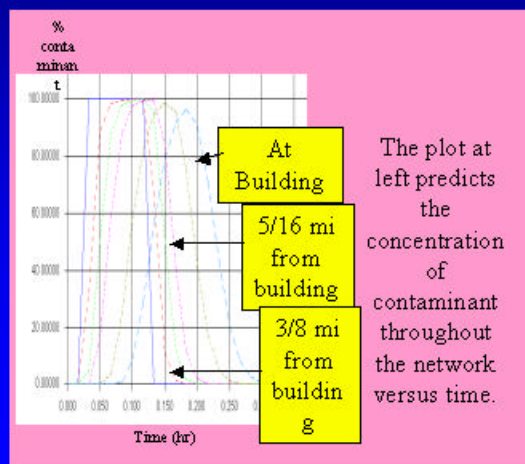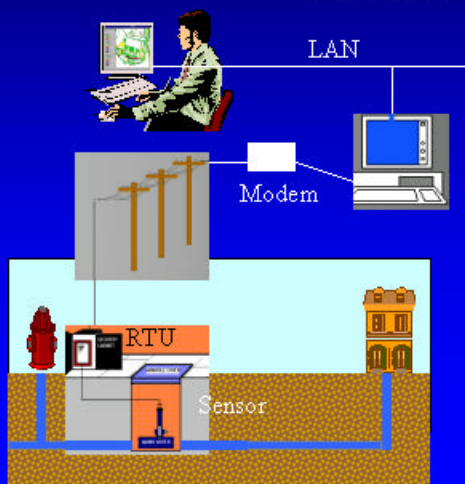
Dynamic Modeling of Water Distribution Systems including Chem/Bio Detection & Countermeasures

Problem: System-specific response to threats/ emergencies (such as chem/bio attack) is often unknown

Solution: Sensor-enabled dynamic models coupled with countermeasures

The plot at left predicts the concentration of contaminant throughout the network versus time.

At Building

5/16 mi from building

3/8 mi from building

Sensor-enabled dynamic models will help detect chem/bio contamination and plan protective responses.

US Army Corps of Engineers ®

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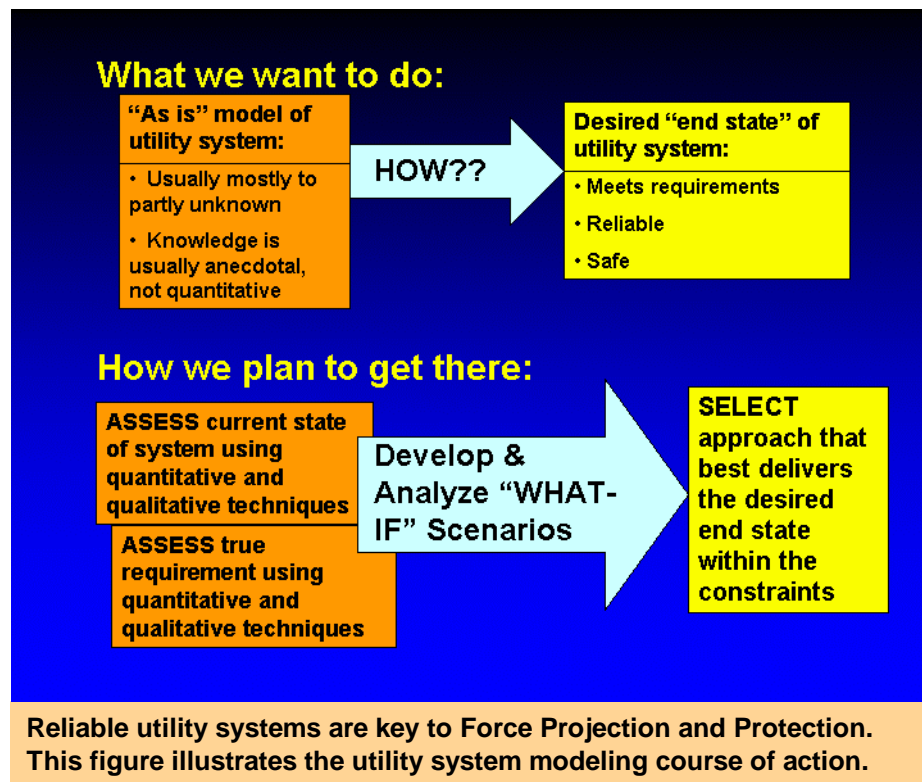Phone: (217) 352-6511, x6771
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What we want to do:

"As is" model of utility system:
- Usually mostly to partly unknown
- Knowledge is usually anecdotal, not quantitative

HOW??

Desired "end state" of utility system:
- Meets requirements
- Reliable
- Safe

How we plan to get there:

ASSESS current state of system using quantitative and qualitative techniques

ASSESS true requirement using quantitative and qualitative techniques

Develop & Analyze "WHAT-IF" Scenarios

SELECT approach that best delivers the desired end state within the constraints

Reliable utility systems are key to Force Projection and Protection. This figure illustrates the utility system modeling course of action.

Approach

This work will develop methods, simulation tools, and models to enable installation and military planners to plan, assess, optimize, and monitor the ability of utility systems to support Army force projection. The user will be able to conduct utility system simulations using real-time data, as well as historical, generic, or hypothetical scenarios. The utility module will interface as a component of the large-scale Fort Future Force Projection package. For water utilities, the approach includes:

?? Pilot testing water dynamic system models for normal operations

?? Developing methods to assess system vulnerability

?? Identifying requirements for CBR contaminant scenarios, through sensor enabled dynamic modeling of changing water chemistry

?? Analyzing potential system operation modify-cations, prevention measures, and mitigation techniques based on real-time modeling data

?? Predicting the water system's response to different contaminant scenarios.

?? Modify software to incorporate the above.

For fuel systems, the approach includes:

?? Adapting a water system model to represent the hydraulic differences of fuels (viscosity, specific gravity, additional equipment etc.)

?? Customizing a modeling tool to analyze military-specific scenarios (conventional operation, mobilization, contamination, blast/fire)

?? Predicting future conditions, including effects on capacity and risk of failure

?? Incorporating real-time sensing and control.

For electrical systems, the approach includes:

?? Reviewing commercial off-the-shelf software

?? Develop requirements including: power flow assessment, cost analysis, reliability assessment, service restoration analysis, and Distributed Generation (DG) management.

?? Develop "what if" scenarios such as: failure of specific equipment or part of the system, adding/modifying a facility, destructive event, and changing facility activity/load level

?? Develop/modify software to incorporate the above.